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IMPACT OF A SELECTED REMEDIAL MATHEMATICS COURSE
ON ACCUPLACER RE-TEST RESULTS

by
Denise Chalow Case

A Thesis

Submitted in partial fulfillment of the requirements of the
Master of Arts in Higher Education Administration
of
The Graduate School
at
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Approved by _____
Dr. Burton R. Sisco

Date Approved August 27, 2009

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ABSTRACT

Denise Chalow Case
IMPACT OF A SELECTED REMEDIAL MATHEMATICS COURSE
ON ACCUPLACER RE-TEST RESULTS

2008/09

Burton R. Sisco, Ed.D.
Master of Arts in Higher Education Administration

The purpose of this study was to evaluate the effectiveness of a selected remedial mathematics course offered at a selected community college. Initial placement test scores were compared with scores resulting from a placement retest after completion of the remedial course. While the majority of students placed higher on the retest, the most significant increases were achieved by students who earned an A for the remedial course. This study also analyzed the level of education and degree major of the instructors of the remedial courses. The results indicate that instructors holding master's degrees may be slightly more effective than those holding bachelor's degrees, and that instructors with mathematics degrees may be slightly less effective than those holding non-mathematics degrees. Implications suggesting better alignment between high school exit exams and college placement exams are discussed.

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Additional gratitude goes to my internship supervising mentor, who will remain unnamed to preserve the confidentiality of the institution in which the study was conducted, for her encouragement, guidance, and assistance with data collection. The associated internship experience broadened my perspective on the practical aspects of higher education.

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CHAPTER I

INTRODUCTION

Statement of the Problem

The American high school diploma is awarded to all students who satisfactorily complete state requirements. Included are credits earned for attaining passing grades in required courses and proficiency in state exams in mathematics and language arts. Students and parents alike assume that possession of a high school diploma ensures that a student is adequately prepared with the skills necessary to advance to college-level education. However, many high school graduates are finding that this is not always true. A look at college data show that most high school graduates, more than 53%, are required to take at least one remedial class in mathematics or language arts. This significantly increases the time and money spent to earn a degree. As a result, many of these students never remain in college to earn a degree.

Nearly 50% of states require high school students to take and pass exams to graduate. Logic implies that passing these exams ensures that students are proficient to enter college-level courses. However, college placement exam scores indicate that far too many high school graduates are deficient enough to be required to take non-credit remedial courses before taking credit-earning courses.

Researchers across the United States have studied enormous amounts of data to determine why high school graduates are not college ready. A recurring theme in

their analyses is that high school proficiency assessments do not assess the same skills as college placement tests. In other words, a gap exists between the expectations of K-12 education and higher education. The data suggest that state test scores are a poor indicator of college readiness (Achieve, Inc., 2008; Conley, 2003a, Kirst & Venezia, 2004; Venezia, Kirst, & Antonio, 2003). This situation is believed by some to be both inefficient and unfair.

Significance of the Problem

Students who pass state proficiency assessments and earn their high school diplomas assume that in doing so they are prepared to enter college. Many are shocked after taking college placement tests to find that they need to take non-credit remedial courses before enrolling in college level courses. These courses add significant amounts of money and time to the total tuition cost of higher education. This is disheartening for the student and their parents who feel short-changed by the K-12 education system and some are prompted to forego a college education altogether. As a result of the high levels of remediation needed, institutions of higher education are becoming increasingly concerned about the quality of K-12 education. Many high school educators, who are following mandated curricula which have been aligned to the state assessments, are concerned as well. However, there is currently little evidence that the two systems are attempting to work together to solve the high remedial rate issue. In the meantime, colleges are making up the difference by placing deficient students into some form of remediation program.

The problem is most prevalent in the two-year community colleges due to open admissions policies. The students who are the least prepared are more apt to attend community colleges. Getting admitted and then matriculated into a community college is easy and gives students the impression that they are ready for college work. Many are surprised after taking placement tests to find that they cannot enroll in college level courses. This is in part due to the misalignment of college expectations and K-12 standards and poor communication between high school and college educators. High school proficiency assessments send the message to students that their skills are adequate for college level work. Many high school educators also assume that passing the proficiency exams indicates that the student is ready. Information about the skills students need to succeed in college is not being communicated from the colleges to the high schools.

Recently, some four-year institutions have reduced or eliminated their remediation programs. In 1998, the California State University system amended its policies to allow deficient students one year to complete remediation coursework. City University of New York, in 2000, began prohibiting deficient students from enrolling in four year institutions until they were able to pass the placement exam. Studies of both policies indicate that a very small percentage of students return to the four year institution (Parker, 2007).

Purpose of the Study

This study evaluated the effectiveness of a remedial course offered at a selected community college in a Mid-Atlantic state, which is referred to as Amethyst Community College (ACC). Students at this two-year institution are tested using the

Accuplacer test before beginning coursework. The results of the Accuplacer test place the student in one of several remedial options. This study analyzed data collected by the college to determine how effective the remedial programs were for the students who were placed into these programs by comparing initial Accuplacer test scores with Accuplacer re-test scores after completion of the remedial course.

Assumptions and Limitations

This study focuses only on the issue of college level remediation and is restricted to a single remedial course held at a single two-year community college resulting in a small data set. Other factors that may also influence remediation rates that are not addressed in this study include but are not limited to variations in secondary school quality, the appropriateness of the tests themselves, and factors that are relevant to individual students such as age, part-time or full-time status, socioeconomic status, and intrinsic motivation. It has been assumed that the data set collected by the institution and forwarded to the researcher is accurate and valid.

Operational Definitions of Important Terms

1. **Accuplacer Test:** A computer-based placement test developed by the College Board and customized and administered by colleges, universities, and technical schools worldwide for appropriate course placement of incoming students
2. **Amethyst Community College:** Fictitious name used to protect the identity of the institution at which the study took place
3. **Community College:** Publicly funded two year institutions of higher education

4. HSPA: High School Proficiency Assessment – a test administered to all high school students in the state of New Jersey to assess knowledge in the areas of mathematics, reading, and writing. High school students in New Jersey must meet proficiency standards on the test to receive a diploma.
5. Faculty: Instructors of the remedial course sections included in the study
6. Placement Test: A test administered to all incoming freshmen to determine how much, if any, remedial work is necessary before enrolling in college level mathematics or English composition classes. Students with high scores on a placement test may qualify to enroll in higher level college courses.
7. Students: People enrolled in the remedial course studied; matriculation status and other personal information unknown

Research Questions

The following research questions guided the study:

1. What is the impact of a selected remedial mathematics course on Accuplacer re-test results?
2. To what extent does the level of education of the instructor affect Accuplacer re-test results?

Organization of the Study

Chapter II provides a review of scholarly literature pertinent to this study. The review focuses on the reasons American colleges and universities need to address the lack of preparation of high school graduates and remediation solutions that have been utilized by higher education institutions.

Chapter III describes the methodology and procedures used in this study.

Chapter IV presents the results of this study focusing on addressing the research questions posed in the introduction.

Chapter V summarizes the study, discusses the findings, poses major conclusions of the study, and offers recommendations for practice and further study.

CHAPTER II

LITERATURE REVIEW

History of Community Colleges

American community colleges are defined by Cohen & Brawer (1982) as institutions that offer associate degrees and occupational certificates to their students in addition to a variety of other services to the communities in which they are located. Since their inception, community colleges have been considered important and necessary.

Two-year colleges began in the early 20th century as an alternative to four-year institutions as a result of the advocacy of several different groups responding to the social and economic climate of the time. Several different movements supported the creation of community colleges, including local community support of public and private two year institutions, the expansion of the public education system, increased professional standards for teachers, the vocational education movement, and an expanding demand for adult and community education. Desire for community colleges was fueled by the idea that small liberal arts colleges could provide the first two years of college while larger universities could focus on the second two years in addition to research. Thus, many of the first community colleges were more akin to an extension of high school, with small enrollments and a focus on liberal arts education with the goal of transferring students to four year

institutions. Primary emphasis was placed on traditional middle class values and developing responsible citizens.

During the 1920s and 1930s, the purpose of community colleges shifted to developing a workforce due to high levels of unemployment during the Great Depression. At that time, the focus was on students who could advance past high school but not attain bachelor's degrees. The community colleges thus began to award two-year associate's degrees. Enrollments in community colleges surged after World War II as the G.I. Bill opened the door for educational opportunity for returning veterans. During these years they were called junior colleges and their curriculum was identical in scope and thoroughness to the first two years of senior colleges and universities (Bogue, 1950).

In 1947, the Truman Commission suggested a network of public community colleges designed to provide education to a diverse group of students at little or no cost along with serving community needs through a comprehensive mission. The 1947 President's Commission on Higher Education proposed free education in grades 13 and 14 at the community colleges for all students making it clear that community colleges had an important role to play. One of those roles was to transform poorly prepared high school students and send only the best on to university study and the 1940s and 1950s saw a number of changes to both community colleges and universities. While new upper-level universities were being built to accept the community college graduates, other four-year schools were almost insistent that their students begin their education as freshmen.

During the 1950s and 1960s the term junior college was applied to lower branches of a larger institution or two-year privately-funded institutions while publicly-funded

two-year institutions were referred to as community colleges. Many community colleges sought to become four-year colleges, but that desire faded in the 1960s when a large number of new community colleges were established to satisfy the drive for social equality which was prevalent in that decade. The Civil Rights Movement made college an option for groups that had been restricted access before. The demands of political and social action resulted in increased federal funding in the form of financial aid to students. Additionally, children of World War II veterans, otherwise known as baby boomers, began to reach college age during this time.

Enrollments surged again in the 1970s with men who desired to escape the draft during the Vietnam War. By the 1970s the term community college included all but a few two-year postsecondary schools. During the 1980s, community colleges returned to their high school roots by working with high schools to provide vocational and technical programs which expanded in number although not all programs were available at all community colleges. The number of community colleges had doubled as students were increasingly completing their first two years of college close to home. During that same time period, the number of students enrolled quadrupled as the community college transformed into a neighborhood institution opening up their doors to a broader segment of the population. As a result, the term community college also included vocational and technical schools that offer associate's degrees or occupational certificates.

The early 21st century is showing a move toward less variety and more specialization, with community colleges concentrating on program areas that address the specific needs of the county. For example, Cumberland County College, located in

Vineland, New Jersey, has increased its offerings in the criminal justice department (recently re-named simply “justice”) in response to the need for personnel at the two large prisons (one state, one federal) located in the county. Atlantic Community College, located in Hamilton Township, New Jersey, is well-known for its Academy of Culinary Arts which began when Atlantic City allowed casino gambling. Now called Atlantic-Cape after a merger agreement with Cape May county, many hotel-related programs have been added in response to the tourist industries in both counties.

Open Admissions

Open admissions is a policy of admitting to college all high-school graduates in an effort to provide a higher education for all. The policy allows any high school graduate to matriculate. Many colleges and universities first experimented with open admissions policies in the 1960s and 1970s. The primary goal of the open admissions policy was to increase minority enrollment that is, to provide equity in education to a segment of the population that had previously been underrepresented in higher education. Timothy Healy, City University of New York (CUNY) vice-chancellor for academic affairs, explained the shift in policy by saying that the university could stop the disappointment and rage of the inner-city youth due to being locked out of careers and robbed of a stake in the city (Cohen, 1974). He promised that the policy would not dilute the overall educational experience. The open admissions program at CUNY offered free tuition, changes in grading and coursework, and remedial and compensatory services to any secondary school graduate who enrolled. Of the 35,000 member class of 1970, 25% would not have been admitted without the open admissions policy due to academic

deficiencies. As a result of the open admissions policy, minority enrollment at CUNY increased from 18.8% in 1970 to 36.6% in 1975 (Cohen, 1974). However after the graduation of the class of 1975 the policy was considered a failure. Prior to the policy, one student stood out above the rest as the head of the class, but by 1976 inflated grades created a situation where more than 10 students had perfect averages. Critics of open admissions policies attributed this to the lowering of standards that occurred as more effort was devoted to the development of basic skills. High school principals began to complain that the open admissions policy was decreasing their students' motivation to perform in high school. The best high school students were the least likely to attend open admissions colleges leaving the colleges with the students who were not the most likely to succeed.

Castro (1974) suggested that problems also resulted from faculty who took one of three approaches in response to their faltering students. The first was an attempt to coerce students into satisfactory completion of the course and simply fail them if they did not. The second was to water down the course content and make tests easier. The third was to quit teaching altogether on the basis that it was impossible to teach such widely heterogeneous groups. Whatever the reasons, while many minority students did enroll in higher education through the open admissions policies of the 1970s, many educational institutions partially reversed such policies and tightened admission requirements in the 1980s and 1990s.

Today, while anyone is able to enroll in college courses for personal fulfillment, matriculation requires that students take a placement test to assess their skills before beginning their coursework. However, community colleges are finding that nearly half of

their students are not prepared for college level mathematics courses. This is particularly true for low-income and minority students (Venezia, Kirst, & Antonio, 2003). At least a portion of the fault lies in the misalignment of high school standards and college expectations and the lack of communication between the two educational systems. The findings of the Stanford Bridge Project, conducted by researchers at Stanford University in California in 2004, indicate that students are unclear about what is expected of them in college, and their high school teachers lack the information needed to explain it to them (Kirst, Venezia, & Antonio, 2004). The researchers also concluded that few students were even aware of placement test requirements.

Presently, there is no way to prepare for college placement tests because they are not connected to K-12 standards, nor are they communicated to high school students or educators (Kirst & Venezia, 2001). For the most part, high school mathematics educators are focused on their students meeting proficiency on the high school state assessments. In higher education the focus is on admissions and beyond. While misalignment and lack of communication is responsible for a large part of the problem, it is the K-12 system that receives most of the blame. Research indicates that connecting the two systems to work together can improve college preparation, readiness, and completion. This is a daunting task, as it involves changes in fundamental policies for both systems.

According to Kirst and Venezia, there are four key policy areas that must be connected to close the gap between the two systems. The first three, finance, data collection, and public reporting of student progress and success will not be discussed here, as the focus of this research does not enter these arenas. The fourth area is curricula

and assessment, in which high school exit standards must equal college entrance and placement standards.

Standards for Success, a research project by the Association of American Universities and the Pew Charitable Trust, indicates that overall states fare poorly in their alignment in cognitive skills such as critical thinking and mathematical reasoning (Conley, 2003b). Conley (2003b) states that even if alignment was somehow achieved, there is no guarantee that the changes would reflect high quality standards and assessment tools. He indicates that there is no real agreement on how to improve student assessment for success in higher education. “A review of what we know and don’t know about secondary and postsecondary standards and policies points to troubling trends, which threaten to potentially undermine the preparation of American secondary students for college education” (Conley, 2003a, p.2). Conley identifies four critical problem areas. First is the misalignment between secondary student preparation and college admissions and placement standards combined with the reluctance of both sides to initiate change, resulting in a vicious cycle. States and school districts want to be sure that their reforms will ensure that their students will meet higher education standards. Higher education institutions are waiting to see the secondary reforms before revising their admissions standards. The second critical problem area was identified as the lack of authentic measures for student assessment regarding college preparation. As a result of the emphasis on using grades to determine student admission, grade inflation has increased at both the secondary and university level. This grade inflation serves to undermine the effectiveness of traditional predictive rationales for university admissions policies. Conley identifies the third problem area as the placement of many students in

remedial classes. Colleges use placement tests to gauge whether students need to be placed in these classes. However, according to a study conducted by the Southern Regional Education Board, nearly 125 combinations of 75 different tests (including the SAT and ACT) in the areas of reading, writing, and math are currently used to place students (Abraham 1992). The fourth problem area is identified as the low retention and completion rates of students of many public universities.

While entering first-year students know very little about the content of most university placement exams, students' confidence in their academic abilities is at an all-time high (Astin, 1999). This lack of knowledge comes from unclear, uncommunicated, and/or inconsistent information about initial freshman placement standards and expectations. Such "mixed signals" are manifested in poor placement test performance and increased need for university remedial education. But many college administrators believe the current system works and does not need to change.

Researchers for the American Diploma Project found that the skills needed for the workplace are essentially the same as those needed for college. A joint venture by Achieve, Inc., The Education Trust, and the Thomas B. Fordham Foundation, the American Diploma Project was launched to determine the skills that all high school graduates need to be successful in college and the workplace and then to help states incorporate those skills into their standards, assessments, and high school graduation requirements (Achieve, Inc. 2004). An initial survey found that college instructors and employers in New Jersey agree that high school graduates are inadequately prepared to meet the expectations of both higher education and the workplace. The greatest amount of criticism came from college instructors who were unsatisfied with the results of high

school graduates in mathematics. These instructors complain that they spend significant amounts of time teaching material that, in their opinions, should have been learned in high school. The project initially resulted in a set of benchmarks for high school mathematics and language arts and a challenge to education policymakers to make the high school diploma count (Achieve, Inc., 2004). Project data report that high schools standards are aligned with postsecondary expectations in 19 states, which was more than double the previous year. Twenty-six additional states are reported to be in the process of aligning high school standards with college expectations. Nine states administer college readiness tests to all high school students as part of their statewide assessment systems with 23 other states planning to do so in the future. The report indicates New Jersey as having aligned high school standards to college expectations in 2008 and college readiness tests (an Algebra II End of Course exam) for all high school students in the planning stage. Although the exam start date was 2008, the anticipated start date for postsecondary use is yet to be determined (Achieve, Inc., 2008). In addition, New Jersey revised the state requirements for graduation from high school. The February, 2009, revisions include the infusion of 21st century skills across all content areas and additional required courses. Effective with the 2012-2013 ninth grade class is a third year of mathematics that builds upon the previously required algebra I and geometry classes, a third year of a laboratory/inquiry-based science, and an economics course.

Placement Testing

The goal of mathematics placement testing is to properly place incoming students into either a college level or remedial course in which the student will be successful. The testing process assumes that proper placement increases student success. The American

Mathematical Association of Two Year Colleges encourages the use of mathematics faculty in developing policies and procedures used to place students and recommends that such policies and procedures include high school records (AMATYC, 2002).

While most higher education institutions utilize only standardized testing for student placement, other institutions use placement scores in conjunction with other data such as high school grades, teacher recommendations, and standardized test scores resulting from the New Jersey High School Proficiency Assessment or the Scholastic Aptitude Test. Hills, Hirsch, and Subhiyah (1990) recommend that placement be determined not only on the basis of achievement but also on learning style. However, most colleges place only on the basis of achievement on the placement tests.

As a result of the inconsistency of college placement procedures, students who are placed into remedial courses on one campus could conceivably place into college level courses on another campus. Moreover, many studies have been done to assess the placement tests. For example, it has been shown that students from low socioeconomic backgrounds as well as certain minority groups generally score lower on placement tests (Hills et al., 1990).

There are also differences in the placement tests being used. Most of the county colleges in New Jersey use the Accuplacer test which although customized for each institution, offers some degree of consistency within the state. However, institutions in other states use other tests. Tests also vary in their format. For example, the Accuplacer test used at some county colleges for placement is computerized, whereas the Companion test used for re-testing by the same institution is pencil and paper.

While some institutions use placement test cutoff scores to place all students into a single remediation course (Hills et al., 1990), others employ the more common method of using several cutoff scores to place students into one of several different remediation paths. Several studies have been done to analyze the effectiveness of mathematics placement systems at many colleges around the country. One of the earliest was done in 1965 by Risser and Davis at Pasadena City College in California. Their research indicated that the best predictors of college readiness were overall GPA, math course final grades, and placement test scores. Further, they indicated the most success with grades earned in previous math courses and the least success with placement tests.

In 1994, Armstrong conducted a study at San Diego Community College District to analyze the relationship between mathematics placement test scores and student performance. Collecting and analyzing data from over 2,000 students within the district, Armstrong found that placement test scores were a reliable predictor of student performance. Rodgers and Wilding (1998) found that a multi-variable mathematical formula incorporating both high school SAT scores and placement test scores was more reliable than placement test scores alone. Another study completed that same year (Bashford, 1998) was conducted at Miami-Dade Community College (since renamed Miami Dade College). Bashford's study was a result of a state change in placement test score cutoff between 1996 and 1997. While the state of Florida did not change the cutoff scores for college preparatory courses the cutoff scores for college level courses increased. Interestingly, Bashford found that the overall pass rate increased for both groups. A University of Minnesota study conducted by Latterell and Regal (2003) found

that using high school ACT test scores was equivalent to using scores on placement tests created by the institution.

Institutions of higher education also vary in their placement test retake policies. The policies range from not allowing retakes to retakes without any other requirements or stipulations. The vast majority of institutions fall somewhere in between. For example, at Amethyst Community College, students who do not place in college level mathematics courses can retest with Accuplacer before registering for a course. In doing so, the initial score is wiped clean and only the second score counts. Those who opt for taking a remedial course or workshop can take another test (Companion) after completing the remedial work.

The benefits of retesting vary as much as the policies do. In 1977, Pearlman found that allowing students to retake placement tests improved retention rates at Palm Beach Community College. Sawyer and Welch (1990) studied the effects of retesting on placement test scores at American College in Iowa and found that while most students did better, the increase was significant only to those who had originally tested close to the college level placement. Although rare, they also found evidence of students doing worse on the retake. Sworder (1990) concentrated his study on students at Saddleback Community College in South Carolina who delayed enrollment in mathematics classes after taking a placement test. He found that students who delayed registration for the placed mathematics course did not do any worse than students who immediately enrolled.

The Accuplacer Test

The Accuplacer test is a placement test which was developed by the College Board (College Board, 2009). It is used by colleges, universities, and technical schools

around the world for appropriate course placement of incoming students. The test itself is customized for each educational institution and is administered by the institution. The test can be administered on or off campus since it is computer-based. Students at Amethyst Community College (ACC) must sign up for the test at the Student Success Center. Results of the test, which are immediate, quickly determine whether an incoming student should be placed into college level courses or into remedial courses for English or Mathematics.

The Accuplacer test is completed online over the internet (College Board, 2009). It is a computer-adaptive test, meaning that the questions presented to the test-taker depend on the test-taker's previous answers as well as the difficulty level of previous questions. It consists of multiple choice questions and tests knowledge of reading comprehension, sentence skills, arithmetic, elementary algebra, and college level mathematics.

The arithmetic section of the test measures the student's ability to perform basic arithmetic operations and solve problems involving fundamental arithmetic concepts (College Board, 2009). This section includes 17 items in three categories. The first is operations with whole numbers and fractions, and includes addition, subtraction, multiplication, division, recognizing equivalent fractions and mixed numbers, and estimating. The second category is operations with decimals and percents and includes addition, subtraction, multiplication, and division with decimals, percent problems, recognition of decimals, fraction and percent equivalencies, and problems involving estimation. The third category in this section is applications and problem solving and

includes questions about rate, percent, measurement, simple geometry, and distribution of a quantity into its fractional parts.

The elementary algebra section includes 12 questions of three types. The first type is operations with integers and rational numbers which includes computation with integers and negative rationals, the use of absolute values, and ordering. The second type, operations with algebraic expressions using the evaluation of simple formulas and expressions includes the addition, subtraction, multiplication, and division of monomials and polynomials, the evaluation of positive rational roots and exponents, simplification of algebraic fractions, and factoring. The third type of question is the solution of inequalities, equations, and word problems. Included in this type are linear equations and inequalities, quadratic equations by factoring, verbal problems presented in algebraic context, geometric reasoning and graphing, and the translation of written phrases into algebraic expressions.

The college level section includes 20 questions from intermediate algebra through precalculus that include five categories. The first, algebraic operations, includes simplifying rational algebraic expressions, factoring, expanding polynomials, and manipulating roots and exponents. Solutions of equations and inequalities make up the second category and includes the solution of linear and quadratic equations and inequalities, equation systems and other algebraic equations. Coordinate geometry includes plane geometry, the coordinate plane, straight lines, conics, sets of points in the plane, and graphs of algebraic functions. Applications and other algebra topics includes complex numbers, series and sequences, determinants, permutations and combinations, fractions, and word problems. The last category, functions and trigonometry, includes

questions about polynomials, algebraic, exponential, logarithmic, and trigonometric functions.

In addition to multiple choice questions there may also be an open-ended question which can be done either on the computer or with paper and pencil (College Board, 2009). Amethyst Community College (ACC) allows calculators to be used during the test. The multiple choice sections of the test have no time limit. All questions must be answered and while students can change an answer to a question, they cannot go back and revisit a question after they move on to the next question. Therefore, if a student does not know the answer to a question, the student must offer a best guess. Scoring is immediate and scores are determined by the number of questions answered correctly as well as the difficulty level of the questions answered. Two copies of the student's scores are printed upon completion of the test. One is given to the student and the other is retained by the educational institution. There is no pass or fail.

At ACC, all degree-seeking students must take the Accuplacer as part of their initial enrollment. Non-degree students must take the Accuplacer test upon completion of 12 credits. Admission to the college is not determined by Accuplacer test scores, however some programs of study and courses may be restricted based on the test results. Any student who transfers into ACC from another college, has already taken the test at another same-state college within the last five years, has already earned an associate's or bachelor's degree from an accredited college or university may be exempt from taking the Accuplacer test. Other exemptions include students who have earned specific scores on the SAT test and those who are taking the ACT ESL Placement test. Some specific programs require applicants to take the Accuplacer test regardless of exemption status.

For example, applicants to the nursing program are required to complete the Accuplacer test regardless of any previous college credits earned.

For all students, the results of the Accuplacer test is used by academic advisors and counselors in conjunction with the student's academic background, goals, and interests, to determine the student's course selection. The best way to prepare for the multiple choice questions on the mathematics portion of the Accuplacer test is to review materials related to arithmetic, algebra, and trigonometry. Students who wish to view sample questions can do so online on the College Board's website.

Remediation Programs

Astin (1999) claims that first-year college students know very little about the content of most university placement exams even though their confidence in their own academic abilities is high. He maintains that their lack of knowledge is due to unclear, uncommunicated, and/or inconsistent information about placement standards and the college's expectations. He cites poor placement test performance and an increased need for remedial education as his evidence. Indeed, the extent of remedial education at the college level is staggering according to statistics from a 1996 NCES report. The report indicates that 81% of public four-year institutions and nearly all public two-year institutions offered remedial courses in 1995. The percentage was lower for private institutions, but at 63%, still seems higher than it should be.

There is much controversy surrounding the use of remediation programs despite their prevalence in higher education. Supporters maintain that remediation programs offer poorly prepared students the chance to catch up to their peers and thus to succeed in college. They maintain that such students are better served by remediation rather than

allowing them to fail in college level courses for which they are not ready (Lazarick, 1997). Opponents counter that any benefits of remediation are outweighed by its high cost. Breneman and Haarlow (1997) estimate that public colleges spent about one billion dollars per year on remediation 10 years ago.

As a result of these costs, some states have cut funding for remediation programs. Recently, some four year institutions have reduced or eliminated their remediation programs. In 1998, the California State University system amended its policies to allow deficient students one year to complete remediation coursework. Students who do not complete remediation are administratively dropped from the university rolls and referred to one of the state's community colleges. The students are eligible to re-enroll at the university after all remedial coursework has been completed. In 2000, City University of New York began prohibiting deficient students from enrolling in four year institutions until they were able to pass the placement exam. The students can opt to enroll in one of the six community colleges that are part of the system and are encouraged to complete remediation and attain an associate's degree before re-applying for a baccalaureate program. Studies of both policies indicate that a very small percentage of students return to higher education. In 2003, for example, only 1,200 of the 4,500 de-admitted students enrolled in a CUNY community college (Parker, 2007).

The controversy is further fueled by uncertainty regarding the effect of remediation on student outcomes. Bettinger and Long (2006) and Jepsen (2006) found positive effects of remediation on college persistence and attainment. Bettinger and Long (2006) compared groups of Ohio students with similar observable characteristics who attended schools with different remediation policies. They reported that remediation had

positive effects on both transferring to a more selective college and earning a college degree. Jepsen (2006), who conducted his research in California, came to the same conclusion by comparing the outcomes of community college students who took remedial courses to those who did not. According to New Jersey Administrative Code and the Education Commission of the States Postsecondary Governance Structures Database, the number of courses for high school graduation is not aligned with those for college admissions (Dounay, 2006).

Summary of the Literature Review

Community colleges in America began as an expansion to the public education system with small enrollments and a focus on liberal art education with the goal of transferring students to four-year institutions. The early 21st century is showing a move toward specialization, concentrating on program areas that address the specific needs of the county. Many community colleges operate with an open enrollment policy offering services to any secondary school graduate who enrolls. While anyone is able to enroll in college courses, matriculation requires that students take a placement test to assess their skills before beginning their coursework. In recent years, community colleges are finding that nearly half of their students are not prepared for college level mathematics courses. At least a portion of the fault lies in the misalignment of high school standards and college expectations. Presently, there is no way to prepare for college placement test because they are not connected to K-12 standards or communicated to high school students or educators. The scores of the placement test are used to properly place incoming students into either a college level or remedial course, although inconsistencies exist as some institutions also consider other data in making placement decisions. Other

inconsistencies between institutions are the result of customization of the tests, or the use of different test entirely. Institutions also vary in the use of placement re-tests. One of the most commonly-used tests is the Accuplacer, developed by the College Board.

Students are placed into appropriate courses, either college level or one of several levels of remediation depending upon their placement test performance. Depending upon the policies of the institution in which they are enrolled, students may be able to re-take the placement test after completing the remedial course. This study investigates the impact of the remedial course on the placement re-test.

CHAPTER III

METHODOLOGY

Context of the Study

Amethyst Community College (hereafter, ACC) is an accredited, co-educational, two-year, public community college located in a middle Atlantic state. Located on a 100-acre (0.40 km²) tract, the campus includes 14 buildings. ACC offers more than 90 career and transfer programs of study, with programs leading to an Associate in Arts, Associate in Fine Arts, Associate in Science, and Associate in Applied Science degrees, in addition to certificate programs. More than 3,000 students attend each semester during the academic year, as well as over 1,500 continuing education and contract training students. More than 12,000 students have graduated from ACC since it opened. Most of the programs offered at ACC include at least one course consisting of in-the-field experience.

More than half of ACC students continue their education at four-year colleges. They have successfully transferred to every college and university in the state as well as a multitude of other colleges and universities across the country. The college's reputation for quality is exhibited by innovative professors who teach in well-equipped classrooms and laboratories. The outstanding academic programs and services offered are driven by ACC's core values of pride, service, and excellence and are a direct result of its vision to serve as a catalyst for creating collaborative relationships across the county that enhance the quality of life through excellence in education, community leadership, and economic growth and its mission to be accessible, learning-centered, and dedicated to serving a

diverse community of learners and employers through quality, innovative programs, services, and the appropriate use of technology for life-long learning. The campus also includes a Fine and Performing Arts Center featuring local and world-class entertainment and cultural events and serves as the cultural center of the region. During summer, the college offers programs for younger students, through a variety of grant programs aimed at enhancement of vital skills such as writing and math and enrichment courses directed at numerous and diverse interests.

The faculty ratio is 19.3% part time and 80.7% full time with 40.2% of course sections taught by full time instructors, 53.8% taught by part time instructors and 6.0% taught by others which includes full time administrators, counselors, and/or librarians. Further breakdown of faculty demographics is illustrated in Tables 3.1 and 3.2.

Table 3.1

Faculty by Race/Ethnicity

		African American	American Indian	Asian	Hispanic	White	Unknown	Total
Full	Male	1	0	1	0	0	0	24
Time	Female	2	0	0	1	0	0	25
Part	Male	3	0	1	2	63	63	90
Time	Female	3	0	2	1	91	91	115
	Total	9	0	4	4	154	154	254

Table 3.2

Full Time Tenured Faculty by Gender/Ethnicity

	African American	American Indian	Asian	Hispanic	White	Unknown	Total
Male	1	0	0	0	16	0	17
Female	1	0	0	1	11	0	13
Total	2	0	0	1	27	0	30

Eighty percent of ACC's graduates are the first in their families to earn a college degree. Student enrollment includes the official headcount enrollment in credit courses reported as of the 10th day each fall semester. Students enrolled in credit courses are generally those seeking degree credit in one of the college's program majors leading to an associate degree, academic certificate, short-term or career certificate. Total credit enrollment is 3527, of which 1938 are full-time and 1589 are part time. The number of students served also includes enrollment in noncredit courses such as those offered through Professional and Community Education. These courses include those in categories such as avocational courses for personal development and/or career enhancement courses building skills related to employment. Noncredit enrollment is currently 2939. The majority of the student body resides in the county and state in which ACC is located. Only 5.3% reside in a different county, of which 0.3% resides outside the state. Characteristics of ACC undergraduate students are illustrated in Tables 3.3 – 3.6.

Table 3.3

Race/Ethnicity of Student Population

	African American	American Indian	Asian	Hispanic	White	Total
Full Time	338	43	26	368	1163	1938
Part Time	278	24	30	278	979	1589
Total	616	67	56	646	2142	3527

The majority of the student population (60.7%) is white. African Americans and Hispanics make up nearly equal shares of 35.7% of the student population. Other groups include 1.8% American Indians (mostly from a local tribe) and 1.6% Asians (mostly

Japanese descendants relocated to camps in the area during World War II). The remaining 0.1% is unknown.

Table 3.4

<i>Gender of Student Population</i>	
Total Students	3527
Full Time Male	749
Full Time Female	1189
Part Time Male	499
Part Time Female	1090
Total Male	1248
Total Female	2279

Table 3.5

<i>Age Distribution of Student Population</i>	
20 & under	1517
21-24	699
25-34	662
35-44	369
45-54	216
55 & over	62
Total Students	3527

There are almost twice as many female students as there are male. While the number of full time and part time females are nearly equal, the number of full time males is nearly twice the number of part time males. As expected, a large majority (62.8%) of the students are under age 25, typical for college students who enroll immediately after graduating from high school. However, a significant number (18.7%) are between the ages of 25-34.

Table 3.6

<i>Students Receiving State-funded Financial Assistance</i>	
TAG	934
EOF	165
Distinguish, G State, & Scholars	47
STARS	206

Results of Accuplacer testing at Amethyst Community College show that of the 492 recent high school graduates tested, 331 or 67.3% showed a need for remediation in at least one skill area. Scores for first time freshmen indicated that 35% of full time and 49% of part time students needed remediation in mathematics.

Population and Sample Selection

The target population was 162 subjects who took a placement test after the Fall, 2008 semester. One was eliminated because it was a staff member. Others that were eliminated include 19 students who took a different test (Companion) and 5 students who had no pre-test score on file. Since the study focused only on those students who were placed into remedial courses, 85 students were eliminated because they placed into college level courses. Therefore, only 52 of the original 162 scores were included in the study.

Instrumentation

The instrument used to compare Accuplacer test scores before and after taking a remedial course is the raw scores attained on the Accuplacer test. At ACC, students who score between 0 and 41 on the mathematics section of the Accuplacer test are placed into the MA085 Basic Math course. Students may also opt to take a MA085 Brushup which includes six hours of review for \$35 after which the student may retest. Students who

score 42-43 on the Accuplacer may opt to take the MA085 Brushup and retest or take MA086 Advanced Basic Math. Scores between 44 and 73 place the student into MA094 Developmental Algebra. Students may opt to complete this course in one semester, or take the two-semester option (MA091 Developmental Algebra Part A and MA092 Developmental Algebra Part B). Students who score between 74 and 75 are placed into MA099 Advanced Developmental Algebra. A score of at least 76 is required to place into the college level courses MA105 Intermediate Algebra, MA109 Principles of Mathematics, or MA115 Mathematical Structures. MA110 College Algebra and MA205 Statistics I require a minimum score of 82. MA120 Trigonometry and MA121 Pre-calculus require a minimum score of 92, and the minimum score for entry into MA130 Calculus I is 104. The students who make up the population of this study were all placed into MA 085 by their first Accuplacer test scores.

Data Collection

Permission was granted from the college Institutional Review Board (see Appendix A) to access the data from college records. Data were retrieved by an administrator who removed all information that might identify the students included in the study. The administrator provided the relevant data to the researcher on jump drive which remained the property of the college. Three years after the conclusion of the study the jump drive will be destroyed by the college administrator who provided it to the researcher.

Data Analysis

Relationships between Accuplacer test scores before the remedial course were compared to Accuplacer test scores after completing the remedial course using Statistical

Package for the Social Sciences (SPSS) computer software. Distribution frequencies were found for students per instructor, instructors' degree level and major (mathematics vs. non-mathematics), and grades earned in the remedial course. Descriptive statistics were run on initial and re-test scores including means, standard deviations, frequencies, and percentages. A Pearson Product Moment correlation was run to see if there were any significant relationships between test score data and educational level of instructors.

CHAPTER IV

FINDINGS

Profile of the Sample

The sample contains data sets for 52 students. There is no profile of the students as all descriptive data for the students were removed before the data were released to the researcher. What is known to the researcher is that the students were all enrolled in the same remedial course, MA085, but in different sections taught by seven different instructors. The distribution of students per instructor are illustrated in Table 4.1.

Table 4.1

<i>Frequency of Instructors (N=52)</i>		
<i>Instructor</i>	<i>f</i>	<i>%</i>
F1	12	23.1
F2	6	11.5
F3	7	13.5
F4	7	13.5
F5	4	7.7
F6	1	1.9
F7	3	5.8
F8	1	1.9
F9	1	1.9
F10	4	7.7
F11	3	5.8
F12	1	1.9
F13	1	1.9
F14	1	1.9

All of the instructors held either a bachelor's or master's degree and were classified as either mathematics or non-mathematics degrees. The proportion of

bachelor's degrees to master's degrees was identical to the proportion of mathematics degrees to non-mathematics degrees. This would seem to indicate that students were taught by instructors with either a mathematics bachelor's degree or a non-mathematics master's degree. However, this was not the case, as is illustrated in Table 4.2.

Table 4.2

<i>Frequency of Degree Level (N=52)</i>		
<i>Degree</i>	<i>f</i>	<i>%</i>
Bachelor's: Math	12	23
Bachelor's: Non-math	11	21
Master's: Math	17	33
Master's: Non-math	12	23

All of the students received passing grades for the remedial course taken after the initial Accuplacer test and before the Accuplacer re-test. While most students' grades were issued using the standard A-F scale, six students were graded using the Pass/Fail system. The majority of students earned a grade of B in the remedial course, with more than half of the students (61.6%) earning A or B. This would indicate that the students were properly placed for success by the initial Accuplacer test. The distribution of grades for the course is shown in Table 4.3.

Table 4.3

<i>Frequency of Grades Earned in Remedial Mathematics Course</i>		
<i>Grade</i>	<i>f</i>	<i>%</i>
A	11	21.2
B	21	40.4
C	14	26.9
Pass	6	11.5

The minimum score for the initial Accuplacer test was 21 and the maximum score was 65, with a mean score of 42.75. The re-test minimum score was 24 and the

maximum score was 109, with a mean score of 71.17. This is illustrated in Table 4.4 where the initial Accuplacer test is noted as Test1, and the Accuplacer re-test after completing the remedial course is noted as Test 2.

Table 4.4

<i>Descriptive Statistics of Initial and Re-test Scores</i>					
	<i>f</i>	<i>Minimum</i>	<i>Maximum</i>	<i>X</i>	<i>SD</i>
Test 1	52	21	65	42.75	11.921
Test 2	52	24	109	71.17	21.189



Using the mean scores, students placed into MA086 after taking the initial Accuplacer test, and MA094 after taking the re-test. This indicates that overall, while students improved after taking the remedial course MA085, they still placed into another (albeit higher level) remedial course. While this finding indicates progress as a result of the completion of the remedial course, it also indicates that a single remedial course is not enough for students to place into a college level course.

Analysis of the Data

Although all of the students included in the data set were placed into MA085 after taking the initial Accuplacer test, four should have been placed into MA086 and 21 should have been placed into MA094 according to their scores. It is unknown to the researcher whether these students were placed into the lower level MA085 course by the college or if the students themselves chose the lower level course. As a result, there were a total of 27 students in MA085. Table 4.5 shows the courses the students placed in for both the pre-test (Test 1) and the post-test (Test 2), and the number of course levels of increase after completion of the remedial course. It is noted that for six students the

retest score was less than the initial test score yielding a negative increase and one student received the same score on both the initial test and the retest.

Table 4.5

<i>Course Placement by Test Scores</i>								
Test 2 								
Test 1 	085	086	094	099	105/109/115	110/205	120/121	130
085	3	0	12	2	2	5	3	1
086	0	0	1	0	0	1	2	0
094	0	1	8	2	3	0	3	3

The largest improvement was from MA085 to MA094. That represents an increase of two levels of improvement for 12 of the 52 students. However, the next largest distribution was eight students who placed MA094 for both tests, showing no improvement. Students who placed into MA085 showed the most improvement overall, with nearly half (25 students) placing in a higher level on the re-test. Only one student placed in a lower level course on the re-test.

Research Question 1: What is the impact of a selected remedial mathematics course on Accuplacer test results?

While only 44% of the students placed into college level after completing the remedial course and taking the re-test, 77% tested into a higher level course. This would suggest that while completing the remedial course does in fact successfully improve test scores, it is not a guarantee that students will test into college level at the completion of the course. A look at the grades earned in the remedial course indicates that an increase in retest scores might be linked to the grade earned in the class. Students who earned a grade of A in the remedial class had the greatest average retest score increase of 41

points, with a range of 11-63 points. Students who earned a grade of B had an average increase of 27 points, although four students' scores had decreased as evident by the -16 to 67 point change range. A similar observation is made when considering students who earned a grade of C in the remedial class, showing an average change of 23 points, but an even wider range of -20 to 68 points with one student performing more poorly on the retest. The six students who earned a P on the pass/fail system showed an average retest score increase of 30 points, with a range of -3 to 49. One student in this group did worse on the retest.

Research Question 2: To what extent does the level of education of the instructor affect Accuplacer re-test results?

Of the 6 students that did worse on the retest after completing the remedial course, 5 were taught by instructors holding bachelors degrees, and 3 holding non-mathematics degrees. The sixth student was taught by an instructor holding a non-mathematics master's degree. The average retest score for those students who were taught the remedial class by an instructor holding a master's degree was 76 as compared to 64 for those taught by instructors holding a bachelor's degree. This indicates that instructors holding master's degrees may be more effective, but the difference is not enough to suggest a strong influence. Analysis of the data using the Pearson Product Moment correlation, found $r = 0.0293$ indicating a weak direct relationship.

Comparing the average retest scores of students in terms of their instructors holding mathematics degrees we would expect the average score to be greater for students taught by instructors holding mathematics degrees. However, the data show that the average score for those students with mathematics-degreed instructors is 68, which is

less than the 76 average score for those students with non-mathematics-degreed instructors. The Pearson Product Moment Correlation value in this analysis found $r = -0.015$, indicating a weak inverse relationship. One possible explanation for this might be that while the mathematics-degreed instructors involved in the study know their content well, they may not be able to communicate the material to their students as well as the non-mathematics-degreed instructors.

CHAPTER V

SUMMARY, DISCUSSION AND CONCLUSIONS, AND RECOMMENDATIONS

Summary of the Study

The sample data set contains data for 52 students enrolled in a remedial mathematics course (MA085) at Amethyst Community College who took an Accuplacer test before and after completing the remedial course. Although enrolled in the same remedial mathematics course, the students were enrolled in seven different sections of the course, each taught by a different instructor. Scores of the initial Accuplacer test showed that not all of the students should have been placed into MA085; some students placed into higher level remedial courses. The instructors held bachelor's or master's degrees, some mathematics majors and some non-mathematics majors. All students received passing grades for completion of the remedial mathematics course. Overall, students improved their Accuplacer test scores after taking the remedial mathematics course, although not all improved well enough to be placed into a college level mathematics course. Of the 52 students studied, only six scored lower on the Accuplacer retest. Increases in Accuplacer test scores may be linked to the grade earned in the remedial mathematics class. Students in sections taught by instructors holding a master's degree showed an average score slightly higher than those who were taught by an instructor holding a bachelor's degree. The average score on the Accuplacer retest was higher for

those students with non-mathematics-degreed instructors teaching the remedial course than for students taught by mathematics-degreed instructors.

Discussion and Conclusions

Success in a college or university is different from success in high school in that institutions of higher education facilitate greater specialization than high schools. Therefore, some students may find that they are able to succeed in higher education even though their mastery in some areas of knowledge and skills is less well developed than others. Students do not need to master all standards required by their state at the same level to receive their diplomas. However, the more of the standards that a student has mastered, the more options the student will have, and the more successful the student is likely to be during the first year of college. The open admissions policies of many community colleges allow for all students to attend college regardless of their level of mastery of the standards. Critics of open admissions policies claim that since the onset of open admissions, more effort is devoted to the development of basic skills. Community colleges are finding that nearly half of their students are not prepared for college level mathematics courses, and Amethyst Community College is no exception. All of the students involved in this study placed into remedial mathematics courses after taking the Accuplacer placement test. There was no way for these students to prepare for the placement test, because it is not aligned to the state K-12 standards. Another explanation for all students placing in remedial mathematics courses is that overall, states fare poorly in their alignment of mathematical reasoning skills, as noted in the Standards for Success research project by the Association of American Universities and the Pew Charitable Trust (Conley, 2003b). The fact that all of the study students placed into remedial

mathematics courses mirrors the findings of Achieve, Inc. in their American Diploma Project, which found the greatest amount of criticism from higher education mathematics instructors (Achieve, Inc., 2004).

The goal of mathematics placement testing is to properly place incoming students into either a college level or remedial course in which the student will be successful, and that goal was reached by the students in this study. All of the students successfully completed the remedial course in which they were placed, although some were placed in a lower level remedial course than their Accuplacer scores indicated. It is highly possible that a small percentage of the students involved in the study could have tested into a college level mathematics course, since not all institutions use the same cutoff scores or even the same placement tests.

Risser and Davis (1965) indicated that the best predictors of college readiness were overall GPA and grades in previous mathematics courses. The data provided for this study did not include this information so it is impossible to confirm this claim. Rodgers and Wilding's (1998) claim that placement test scores and SAT scores together are the best predictors of college readiness is also impossible to confirm with this study for the same reason. However, Armstrong (1994) indicated that placement test scores were a reliable predictor of student performance in his study at San Diego Community College and the results of this study support that.

Placement retesting after completion of the remedial course in this study provides more validity to Sawyer and Welch's (1990) study at American College in Iowa. They found that most students scored better on the retest and retest scores lower than initial

scores were rare. Indeed, of the 52 students in the study, only six scored lower on the retest.

It is not known if the students in the study are degree-seeking students who are required at Amethyst Community College to take the Accuplacer test as part of their initial enrollment, or if they are non-degree students taking the Accuplacer upon completion of college level courses equaling 12 credits. Admission to ACC is not determined by Accuplacer test scores so it is also not known if the students in the study are matriculated or non-matriculated. It is also possible that not all of the study students are freshmen. Astin (1999) claims that first-year college students know very little about the content of most university placement exams due to unclear, uncommunicated, and/or inconsistent information about placement standards and the college's expectations. Therefore, some of the increase in retest scores in this study could be due to the students' familiarity with the placement test having taken it earlier in the semester.

A 1996 NCES report indicated that nearly all public two-year institutions offered remedial courses in 1995, with supporters of remediation claiming the chance for poorly prepared students to catch up to their peers and to succeed in college, and critics countering that any benefits of remediation are outweighed by the high cost. All of the students in the study paid tuition for their remedial courses, so this study backs the supporters of the NCES report. Indeed, the results of this study provide evidence of positive effects in that students successfully completed the remedial course with a grade of C or higher.

The results of the study show interesting results when comparing the students' Accuplacer retest scores with their instructors' educational backgrounds. One would

expect higher test scores from students taught by an instructor holding a master's degree over a bachelor's degree, and indeed that was the case in this study, although not to the extent expected. The average Accuplacer retest score for those students taught remedial mathematics by an instructor holding a master's degree was 76, with a range of scores from 24 to 109, while the average retest score for students taught with an instructor holding a bachelor's degree was 64 with a range of 30 to 100. These numbers are much too close to come to any reasonable conclusion that the instructor's degree level had an effect on student retest scores. Similarly, there is little evidence to conclude that there is a difference between those instructors holding a mathematics degree as opposed to a non-mathematics degree. Indeed, students taught by an instructor holding a non-mathematics degree scored slightly higher, with an average score of 76 and a range of 30 to 109, while those students taught by an instructor holding a mathematics degree scored an average of 68, with a range of 24 to 100. However, once again the numbers are too close to indicate a strong relationship. There are many additional variables not included in this study concerning instructors that could be of great influence in student success.

Recommendations for Practice

As a result of this research, it is recommended that state standards be better aligned to higher education expectations. One way to accomplish this would be to make high school exit exams serve dual-duty as college entrance and placement exams. While there is no guarantee that such a change would reflect high quality standards and assessment tools (Conley, 2003b), a single assessment tool used by both K-12 and higher education systems would force the standards of both systems to be more closely aligned. It would also cut the financial burden of placement testing by sharing the cost of the

testing with the K-12 system. Once a single test system is in place, there needs to be a consensus regarding cutoff scores. In this way, all educators at all levels, at least within a single state, would be clear as to the expectations and scores needed for students to be deemed college-ready.

Recommendations for Further Research

It is understandable that the only student information offered to the researcher was student test scores and remedial course grades in the interest of student confidentiality. However, those at the institution with access to the full data may wish to look deeper. Because of the large difference in the ratio of males to females at the college, it might be worth looking at the test scores in that light. Due to the strong recommendations found during this research for using placement test scores in conjunction with GPAs and/or grades attained in high school mathematics courses, it would be advantageous to look at these data if available as well. Ideally, the study should be repeated, hopefully with a larger student population, to confirm the findings of this study. Lastly, it would be informative to do a follow-up study regarding persistence of the students involved in this study.

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APPENDIX A

Institutional Review Board Approval Letter



April 29, 2009

Denise Chalow Case
1616 Pennsylvania Ave.
Lot 243
Vineland, NJ 08361

Dear Denise Chalow Case:

In accordance with the University's IRB policies and 45 CFR 46, the Federal Policy for the Protection of Human Subjects, I am pleased to inform you that the Rowan University Institutional Review Board (IRB) has exempted your project:

IRB application number: 2009-182

Project Title: How do the Accuplacer Mathematics Test Scores of Selected Community College Resulting in Remedial Mathematics Compare with Accuplacer Test Scores After Completion of the Remedial Course by the Same Students During the Fall 2008 Semester?

In accordance with federal law, this approval is effective for **one calendar year** from the date of this letter. If your research project extends beyond that date or if you need to make significant modifications to your study, you must notify the IRB immediately. Please reference the above-cited IRB application number in any future communications with our office regarding this research.

Please retain copies of consent forms for this research for three years after completion of the research.

If, during your research, you encounter any unanticipated problems involving risks to subjects, you must report this immediately to Dr. Harriet Hartman (hartman@rowan.edu or call 856-256-4500, ext. 3787) or contact Dr. Gautam Pillay, Associate Provost for Research (pillay@rowan.edu or call 856-256-5150).

If you have any administrative questions, please contact Karen Heiser (heiser@rowan.edu or 856-256-5150).

Sincerely,

A handwritten signature in cursive script that reads "Harriet Hartman".

Harriet Hartman, Ph.D.
Chair, Rowan University IRB

c: Burt Sisco, Educational Leadership, Education Hall

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